DOCUMENT RESUME

ED 249 585 EA 017 110

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TITLE Teacher Effects.
PUB DATE Jun 84
NOTE 25p.; In: "Making Our Schools More Effective: Proceedings of Three State Conferences." See EA 017 101.
PUB TYPE Speeches/Conference Papers (150) -- Information Analyses (070)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Classroom Communication; Classroom Techniques; Elementary Secondary Education; Pacing; Research Needs; Research Problems; Teacher Attitudes; *Teacher Behavior; *Teacher Effectiveness; *Teacher Influence; *Teacher Role; *Teacher Student Relationship; *Teaching Methods; Time Factors (Learning); Time Management; Time on Task

ABSTRACT

This paper presents recently reported findings that associate teacher behavior with student achievement. These findings fall under 5 general categories: time usage, classroom management, teacher expectations, teacher effectiveness research, and specific teacher behaviors. Research on time usage has demonstrated that the same amount of learning time can have different consequences, depending on both student attention and approriate instruction. The discussion of classroom management research concludes that good management skills provide a necessary, but not sufficient structure for active classroom learning. The section on teacher expectations focuses on the need for teachers to moderate their differential interaction patterns with high and low achieving students. An extensive study on teacher effectiveness has established correlations between student achievement scores and teacher behavior patterns. Successful teachers were identified as those who were more active in presenting, explaining, illustrating, and reinforcing concepts, while those teachers with lower student achievement gains relied more on seatwork. The section on specific teacher behaviors summarizes research conclusions in 5 general aspects of teaching: quantity and pacing of instruction, giving information, questioning the students, reacting to student responses, and handling seatwork/homework assignments. Three general conclusions are drawn from the review as a whole: (1) research findings have the potential to affect classroom practice; (2) research findings need to be systematically disseminated in teacher education programs; and (3) new research is needed to clarify the relationship between classroom process variables. (TE)

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TEACHER EFFECTS

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This paper presents some recently reported findings that associate teaching behavior with student achievement. It is important to emphasize that research on teaching effects cannot be equated with teacher effectiveness per se, in part because research has primarily emphasized the effects of instructional behavior on the mean or average performance of students on achievement tests. Although this is certainly important information, teachers are expected to accomplish more than simply stimulating student achievement in basic areas. Those who wish to use the results of this research in teacher education and/or evaluation programs should therefore study the limitations of extant data. These limitations have been discussed at length elsewhere (Brophy & Good, in press; Good, 1983, in press; Good & Brophy, in press). Furthermore, I believe that presenting research information about improving classroom performance to teachers will be effective only if the findings are accompanied by detailed information about decision making (applying findings to particular contexts) as well as knowledge about student learning and development and subject matter and curriculum development. (For a detailed discussion of this perspective see Good & Brophy, 1978, 1984).

General Review

A major purpose of this article is to describe some of the variation in classroom process and to illustrate how these behaviors influence student achievement (for more complete reviews see Brophy, 1979, 1983; Good, in press; Good, Grouws, & Ebmeier, 1983; Good & Hinkel, 1982; Rosenshine, 1983; Weinstein, 1983).

* The author gratefully acknowledges the time and resources made available at the Center for Research in Social Behavior, University of Missouri-Columbia. He is also grateful to Patricia Shanks for typing the article and to Gail Hinkel for her careful editing of the paper.

** The author has written extensively upon this topic recently, and portions of the present article have drawn upon other recent articles Brophy & Good, in press; Good, 1982, 1983, in press; Good & Brophy, in press; Good & Hinkel, 1982).

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Variation in Time Usage

Data collected in the Beginning Teacher Evaluation Study has shown that the amount of time allocated to a particular topic varies considerably from school to school and from classroom to classroom. Furthermore, once instruction in a subject has begun, studies show that the actual time spent on instruction varies among classrooms. Estimates differ, but studies basically indicate that only about 50 to 60% of the school day is actually used for instruction.

However, although variations in amount of time-on-task occur across days, students, and classrooms, little research has attempted to ascertain the sources of this variation: student factors, classroom teaching practices, or day-to-day fluctuations. It is clear from a variety of studies, though, that teachers' beliefs and behaviors are strongly related to time utilization (e.g., Arlin, 1982; Schmidt & Buchmann, in press).

Finally, it is worth noting that some areas of the curriculum appear to receive but little instructional time. In a study of 75 teachers in Grades 2-6, Ebmeier and Ziomek (1983) found that an average of only 15 minutes per week was spent on science in second grade classes. By fifth grade, this time had only increased to 43 minutes. Furthermore, the time spent on science in most classes was considerably lower than what the district recommended.

Mode of instruction is a manipulable variable which has been shown to be related to engagement. Using the BTES data, Rosenshine (1980) found that engagement was 70% during unsupervised seatwork and 84% during teacher-led discussion. These differences are important because students spend about 70% of classroom time doing seatwork, a practice necessitated by grouping. However, whether whole- or small-group instruction is better depends upon whether the losses in time through grouping are compensated for by increased quality of group instruction (appropriate seatwork tasks; instruction which is better matched to students' ability). However, most empirical evidence suggests that too often classroom designs that call for large amounts of student seatwork are marked by insufficient procedural details and tasks that are poorly matched with student ability (e.g., Anderson, 1981; Doyle, 1982).

Studies of Time and Learning

Most recent studies of time and learning involve engaged time, reflecting the opinion of many persons that an indisputable relationship has been established between engaged time and amount of learning (Borg, 1980; Harnischfeger & Wiley, 1976; Sirotnik, 1983). However, others are more qualified in their support of this relationship (Husen, 1967; Karweit, 1976; Kepler, 1980).

Problems with Time Research

Part of the problem with studies of time resides in the fact that time measures in many studies have been taken independent of measures of instructional behavior (what and how well are teachers doing), classroom organization, and curriculum task, The early emphasis upon time measures per se (independent of context) were understandable but given extant knowledge and our increased capacity for studying time (i.e., methodological advances in the BTES study), it is time to become more integrative and comprehensive in our research. Clearly, the work by Berliner (1979) shows that more refined measures of time (e.g., academic learning time) are more strongly associated with student achievement than are measures that do not consider the quality of time (e.g., allocated or engaged time).

Among the many reasons that time measures do not predict achievement better is the fact that the curriculum tasks students are assigned can be inappropriate or irrelevant even though students appear to be "engaged." Students often are poorly prepared for seatwork assignments (teachers fail to provide students with an adequate rationale or motivation for doing the work or do not give students adequate procedural directions or sufficient information about the concept being studied), are assigned tasks that fill time but do not logically extend students' understanding of subject matter content, and are not given evaluative feedback about class work (Doyle, 1982). Under such conditions one would not expect time-on-task to predict student achievement.

It is also the case that sometimes students' apparent engagement can be misleading. Peterson and Swing (1982) interviewed students who had been taught a lesson on probability. They found that some students who appeared to be paying attention to lectures or class discussions were actually thinking about other things, such as how they would perform in comparison to other pupils if they were called on. Peterson and Swing found that attending as measured by a student's response to an interview was a better predictor of achievement than attending measures based on classroom observations. Other researchers have also demonstrated the need to study the quality of students' cognitions as well as their direct task behavior (Rohrkemper & Bershon, in press).

Given these problems with time measures, why then do they relate to student achievement? It appears that time measures do consistently relate to student achievement but that this relationship is not always substantial (although these relationships are positive and range from weak to moderate). As has been argued elsewhere (Good & Hinkel, 1982) it is likely that measures of engaged time tend to show at least some correlation with student achievement because even superficial task involvement suggests that (a) the teacher possesses minimal managerial skills, (b) the teacher has negotiated some compliance with students, (c) there is some apparent agreed upon direc-

tion and purpose in the class, and (d) at least some of the time students reflect upon assigned work.

Implications of Research on Time

It now seems clear that the same amount of learning time can have dramatically different consequences, depending upon classroom and individual student factors, and that learning depends upon both student attention and appropriate instruction. Theories of classroom learning (and subsequent studies of time and learning) should be based more on accommodating student diversity in ability and on quality of instruction rather than on allocated time per se. This dynamic view of learning assumes that factors affecting classroom learning vary over time (e.g., student interest, instructional pace) and that on-going events in classrooms affect this variation (e.g., student composition factors, specific subject matter assignments). Time spent on academic tasks is important, but quality of the time expenditure is more important. More research is needed to understand issues associated with quality.

Classroom Management

In the 1960's it was popular to view classroom management as classroom discipline and considerable emphasis was placed upon what to do after students misbehaved. A research paradigm initiated by Kounin (1970) and validated and expanded upon by a number of researchers in the past few years has strongly illustrated that good classroom managers are not sharply differentiated in terms of how they react to student misbehavior. Rather, the key behaviors that distinguish good classroom managers are techniques which prevent misbehavior by eliciting student cooperation and involvement in assigned work.

Kounin (1970) found that withitness, momentum, alerting, accountability, and overlapping were all positively and at least moderately correlated with student involvement in classroom lessons. Kounin's basic findings have been expanded somewhat. For example, researchers have subsequently noted that teachers can alert or engage in too much accountability as well as too little. Fundamentally, however, Kounin's work has been consistently replicated by follow-up research and remains an important source of information about classroom management.

Emmer, Evertson, and Anderson (1980) studies 27 third-grade teachers during the first week of school as well as throughout the remainder of the year. These investigators attempted to identify teachers who had comparable classes at the beginning of the year but differed in their management effectiveness (degree of student involvement in lessons) during the year. The findings of this study suggest that the form of the management system is not as important as

the quality with which it is implemented. The authors found that what distinguished the more effective managers was the degree to which the rules and procedures were integrated into a workable system and how effectively the system was taught to students. The effective managers were superior primarily because of their clear expectations, commitment to teach these classroom routines, and their systematic follow-through.

Evertson and Anderson (1979) report that better managers were also more careful monitors of student behavior and dealt with misbehavior more quickly than less effective managers. More effective managers alerted students to the behaviors they expect and held students accountable for those behaviors. To the extent that students internalized these rules, they could monitor their own behavior more continuously (e.g., they knew when and how to get help from other students about missed assignments). Communicating classroom norms for conduct and procedures not only makes the individual learner more efficient (e.g., minimal time wondering about when or how to approach the teacher for feedback), it also minimizes the number of situations that demand complex management skills.

Why Proactive Management Works: Toward a Theory

Teachers who are successful managers start the year by establishing rules and procedures and by communicating expectations for classroom behavior. Other teachers who are ambiguous about their behavioral expectations spend much time attempting to clarify expectations. Students in these teachers' classes may spend considerable time wondering (sometimes justly so) whether their behavior is inappropriate or not. In effective managers' rooms it is thus easier to know what is expected; and it is easier for students and teachers to monitor classroom behavior because they can distinguish appropriate from inappropriate behavior.

It is important that teachers who establish rules actively monitor and deal with inappropriate behavior (especially serious misbehavior). Effective managers may therefore sanction more behavior during the first three or four days of the year than do other teachers. Because students eventually begin to engage in fewer off-task behaviors, it soon becomes even easier for the teacher to monitor the class (few disruptions to attend to) and to sanction behavior appropriately (e.g., correct the right student for his/her misbehavior). Failure to follow up on inattentive, disruptive behavior suggests to students that the teacher is not serious about maintaining rules and such behavior encourages students to do as they please. Similarly, a teacher who consistently reprimands the wrong student (e.g., a student who did not misbehave or a student who joined but did not initiate the misbehavior) indicates to students that he/she does not have the skills to maintain a management system (why not misbehave if you're as likely to be sanctioned for misbehavior when attending to assigned tasks as you are when actually

misbehaving?). If teachers exhibit a lack of purpose, and/or a lack of interest in maintaining a management system, it is likely that students will ignore the teacher and classroom rules much of the time.

If teachers establish reasonable and workable rules, hold positive expectations for student participation in those rules, and insist upon appropriate behavior when necessary, I believe that students will understand the teacher's seriousness and purposefulness about classroom management and will begin to internalize classroom rules, expectations, and procedures.

In addition to establishing procedural and behavioral expectations, teachers must also demand that students use their time to complete curriculum tasks. Effective managers assume that students will complete assignments and hold students accountable for work. Students know what to do when they finish assignments and do not waste time trying to determine the next step. That is, effective managers construct classroom environments in which expectations for student behavior are <u>continuous</u>.

In some classrooms teachers make it difficult for students (as well as teachers) to monitor their own behavior. For example, following a demonstration lesson such a teacher might assign seatwork but say, "If you work now you won't have homework." Such statements and expectations make students' classroom role ambiguous. Presumably, students can do the work now or later. Hence, when students choose not to do seatwork it is difficult to tell if their behavior is appropriate or inappropriate. Furthermore, there is the question of what these students will do while other pupils are likely engaged in seatwork.

In contrast, more effective managers are likely to make a transition from demonstration to seatwork in the following way. "Now you do problems 15-30 at your desks. In ten minutes we will check to see what progress you have made and correct any problems we encounter. If you have difficulty with a problem do the next one and I'll be around to help you. Get started now." Here the students' role is clear; under all conditions they should be attempting to do assigned work...even if they encounter difficulty they know to proceed to the next problem.

In essence, a good management system announces intentions and makes it possible to actively monitor teacher and student behavior to see if progress is being made in shared goals. Such information increases the understanding of students who are intrinsically motivated by school tasks and of teachers concerning how to proceed and do well in the classroom. A management system helps to establish the conditions necessary for students without these orientations to learn self-control and to engage in academic tasks. These students come to understand that classroom rewards and privileges are associated with personal progress on assigned tasks. Without highly developed

management skills a teacher will rely on simplistic and routine assignments which elicit cooperation from students (Doyle, 1982).

As students become older, there should be less need for teachers to remind them of what behavior is appropriate. Still, students at all ages should have an understanding of what constitutes appropriate work and behavior. Students also need feedback about their progress on self-chosen goals as well as information on goals established by the teacher. After students have developed appropriate learning expectations and independent work skills (they believe they can do assigned seatwork, know when they are confused, and know how to obtain information), then teachers can reasonably require students to work more independently (students work for extended time periods without feedback) and assign them more complex tasks (projects that do not have one acceptable answer).

Good management skills provide a necessary, but not sufficient, structure for active classroom learning. I believe that poorly managed classes inhibit students' involvement in the instructional program and negatively affect learning outcomes. The correlational evidence relating the management behaviors reviewed here to student achievement is very consistent and the obtained relationships are typically at least moderate (Brophy, 1983). Furthermore, there is increasing experimental evidence that the managerial principles discussed above can be taught to teachers, who can use them to improve student attention to assigned work (e.g., Anderson, Evertson, & Brophy, 1979; Brophy, 1983; Good, Grouws, & Ebmeier, 1983).

Recent research on management is important but it, like the research on time, yields guidelines not answers. A good illustration of the potential problem with blind application of findings can be seen in data reported by Doyle (1983). He found that it was possible to identify some teachers who were poor managers (using process-product research criteria) but who obtained high student achievement.

Teacher Expectations

Much of the research conducted in the 1970's consisted of classroom observational studies aimed at determining what teachers do in their interactions with high- and low-achieving students. The extent to which teachers differentiate in their behavior toward students has been found to represent an individual difference variable, with some teachers varying their behavior more than others (Brophy & Good, 1974; Cooper & Good, 1983).

Although the causes of differential interaction are not definitely established, it is clear that many teachers vary sharply in their interaction patterns with high- and low-achieving students. Teachers differentiate their behavior toward students they perceive as high or low achievers in a variety of ways. (See Appendix 1 for a

list of some of the more common behavior. For a comprehensive discussion of these variables, see Good & Brophy, 1978, 1984).

Data from the extensive empirical and conceptual work in the area of teacher expectations research do not yield rules concerning teacher behavior toward high and low achievers. It is important to accept the fact that teachers can expect too much or too little in their instructional assignment interactions with students. This dilemma also has to be addressed by curriculum specialists who write textbooks and by policymakers. There are many instances in which teachers need, for example, to assign different types of material to high and low achievers. Teachers can also make instructional mistakes by treating students too much alike, as well as too differently. Observational studies of classrooms suggest that the problem varies from classroom to classroom. Hence, simple rules like increase "wait time" for "lows" will do more harm than good (i.e., some teachers are already waiting an appropriate length of time).

As I point out elsewhere (Good, 1983, in press), because the variables that affect teaching and learning are numerous, complex, and interrelated, knowledge of concepts related to teacher expectation effects is best provided along with judgmental and decision-making skills about its appropriate use. Teachers should not be given a list of behaviors they need to routinely perform. Information about expectation effects has to be combined with extensive knowledge about how children learn as well as knowledge of child development if such information is to be used appropriately.

Teacher Effectiveness Research: Active Teaching

Concern with what teachers actually do in the classroom led many researchers to focus on how teachers interacted with high- and low-achieving students. An incidental outcome of this research was the demonstration that teachers vary greatly across classrooms in their behavior, as well as in how they distribute their time and resources within classrooms.

Our initial research on this problem began with a sample of over 100 third- and fourth-grade teachers. Looking at test scores over a 3-year period, we found that teachers varied considerably in their impact on students' learning, despite the fact that they were using the same textbook and in most cases were teaching comparable students. Our initial data were a demonstration of an apparent teacher effect. Some teachers produced much more mathematics learning than did other teachers teaching in comparable settings.

We felt that observing teachers who had a stable and relatively high or low level of effectiveness would be an excellent basis for estimating the relative value of different teaching behaviors. Hence, our observational research focused upon teachers who were consistently high and low across several consecutive years in their

ability to produce student performance on standardized achievement tests. We found that stable, high and low teachers differed in their classroom behavior (for details see Good, Grouws, & Ebmeier, 1983).

Although we were pleased with the naturalistic findings in that they provided some clear contrasts between relatively high and low gain classrooms, we felt that it was important to determine whether a more direct association could be established between the behaviors that were identified in our observational, naturalistic study and student achievement.

In particular, we wanted to see if we could instruct teachers to behave in ways consistent with the behavior of high gain teachers and to determine what, if any, impact such behavior would have on student achievement. Because of the expense involved in field testing the program, we wanted it to be as comprehensive as possible. Thus, in addition to including the contrast obtained in our earlier naturalistic studies, we tested some of the promising findings from other teacher effectiveness studies as well as our understanding of what some effective teachers were doing. That is, we were not tied completely to the group average obtained in the naturalistic study. Writing the training program resulted in a 45-page manual for teachers. The program, as pointed out elsewhere (Good & Grouws, 1979), is a system of instruction: (a) instructional activity is initiated and reviewed in the context of meaning; (b) students are prepared for each lesson stage to enhance involvement and to minimize errors; (c) the principles of distributed and successful practice are built into the program; (d) active teaching is demanded, especially in the developmental portion of the lesson (when the teacher explains the concept being studied, its importance, etc.). See Appendix 2 and 3 for an example of the organizational structure associated with the program (for complete details of the training program see Good, Grouws, & Ebmeier, 1983).

Pre- and post-testing with the standardized achievement and content referenced tests indicated that after 2 1/2 months of the program, the performance of students in experimental classrooms was considerably higher than those in control classrooms. It was also found that experimental students reported significantly more favorable attitudes at the end of the experiment than did control students. Also, research at the junior high level suggests that secondary teachers can implement the program with positive impact on certain aspects of students' mathematics achievement (Good, Grouws, & Ebmeier, 1983).

Our research on mathematics instruction, especially at the elementary school level, has convinced us that teachers do make a difference in student learning, and that inservice teachers can be trained in such a way that student performance can be increased. The system of instruction that we see as important can be broadly characterized as active teaching. It is instructive to note that in our experimental work active teaching was an important difference between

teachers who were getting good achievement gains and those who were getting lower-than-expected gains. Teachers whose students made higher gains were much more active in presenting concepts, explaining the meanings of those concepts, providing appropriate practice activities, and monitoring those activities prior to assigning seatwork. The fact that these teachers appeared to look for ways to confirm or disconfirm that their presentations had been comprehended by students was particularly important. They assumed partial responsibility for student learning and appeared to be ready to reteach when necessary.

In contrast, teachers who were getting lower gains tended to rely much more on seatwork activities and often their students were doing work without a good conceptual understanding of what they were doing and why. In some cases students did not receive adequate procedural instructions for seatwork and teachers appeared to ignore signs from students that indicated either procedural or substantive misunderstanding.

Qualifications

One important consideration is that in a variety of studies using the Missouri Mathematics Program, experimental groups have done better than related control groups. However, the magnitude and importance of the differences are more evident for some teacher and student combinations than others. It is clear that certain types of students and teachers together tend to do better using the treatment than do other combinations of students and teachers (Ebmeier & Good, 1979). The effects of the program on some teacher-student combinations have been replicated by Janicki and Peterson (1981). It also seems that the classroom organizational structure interacts with the effects of the instructional treatment (Ebmeier, Good, & Grouws, 1980).

It should be evident that there is no single system for presenting mathematics concepts effectively (organizational structure does not predict effectiveness). For example, some of the control teachers in our studies have obtained high levels of student achievement using instructional systems that differ from those presented in the program we have developed. More information about the classroom contexts and particular combinations of teachers and students that make the program more or less effective is needed. Research on other outcome measures such as problem solving and estimation should also be conducted (see Reys & Bestgen, 1981 for a good discussion of estimation skills), and it is important that outcomes other than subject-matter mastery be explored as important events per se in addition to seeing if gains in achievement come at the expense of other important outcomes (for a good discussion on teaching self-control see Anderson & Prawat, 1983).

Still, it is satisfying to see that the instructional program we have developed (and programs developed by others) seems to be a

viable system that teachers are willing to implement, and that it positively influences student achievement. We now need to know much more about why some teachers implement the system more extensively than others and what local school features (including student characteristics and classroom structure) lead to greater levels of implementation. In particular, it will be necessary to study both naturalistically and experimentally mathematics teachers who use individualized and small-group practices more successfully than do other teachers.

I suspect that many aspects of the model will be present in individualized and small-group organizational structures; however, some new format variables will likely emerge from such studies. Research on teacher effectiveness in other organizational structures will clearly be of considerable value in theory building, and also in understanding why certain patterns of classroom process are helpful for certain students as they learn particular concepts.

Specific Teacher Behaviors

This section of the paper is drawn from a comprehensive review of the literature (Brophy & Good, in press) and summarizes some of the more specific conclusions that can be drawn from the extant literature about teacher behaviors that maximize student achievement. These conclusions are presented first as three general aspects of teaching and then information for handling specific lesson parts is discussed. However, it is important to emphasize again that these conclusions cannot be equated with teacher effectiveness.

Quantity and Pacing of Instruction

The most consistently replicated findings link achievement to the quantity and pacing of instruction. Amount learned is related to opportunity to learn, whether measured in terms of text pages covered or percentage of test items taught through lecture or recitation. Opportunity to learn is determined in part by length of school day and school year, and in part by the variables discussed below.

Role definition/expectations/time allocation. Achievement is maximized when teachers emphasize academic instruction as a major part of their role, expect students to master the curriculum, and allocate most of the available time to curriculum-related activities. This is seen in relationships involving measures of teachers' role definitions and expectations, high-inference ratings of the degree to which teachers are businesslike or task-oriented, and low-inference measures of time allocated to academic activities rather than to activities with other objectives.

Classroom management/student engaged time. Not all time allocated to academic activities is actually spent engaged in these

activities. Engagement rates depend on the teacher's ability to organize and manage the classroom as an efficient learning environment where academic activities run smoothly, transitions are brief and orderly, and little time is spent getting organized or dealing with inattention or resistance, as noted earlier in this paper. Key indicators of effective management include: good preparation of the classroom and installation of rules and procedures at the beginning of the year, withitness and overlapping in general interaction with students, smoothness and momentum in lesson pacing, variety and appropriate level of challenge in assignments, consistent accountability procedures and follow-up concerning seatwork, and clarity about when and how students can get help and about what options are available when they finish. Extended practical discussions of these variables are presented elsewhere (Good & Brophy, 1984).

Consistent success/academic learning time. To learn efficiently, students must be engaged in activities that are appropriate in difficulty level and otherwise suited to their current achievement levels and needs. It is important not only to maximize content coverage by pacing the students briskly through the curriculum, but also to see that they make continuous progress all along the way, moving through small steps with high rates of success and minimal confusion or frustration. If lessons are to run smoothly without loss of momentum and students are to work on assignments with high levels of success, teachers must be effective in diagnosing learning needs and prescribing appropriate activities. Their questions must usually yield correct answers (about 75% of the time) and seldom yield no response at all, and seatwork activities must be completed with 90 to 100% success by most students. Appropriate seatwork will extend knowledge and provide needed practice, but it will also be "doable" because it is at the correct difficulty level and because students have been prepared for it. Thus, the high success rates result from effort and thought, not mere "automatic" application of already overlearned algorithms. Continuous progress at high rates of success, carried to the point that performance objectives can be met smoothly and rapidly, is especially important in the early grades and whenever students are learning basic knowledge or skills that will be applied later in higher-level activities.

Active teaching. Students achieve more in classes where they spend most of their time being taught or supervised by their teachers rather than working on their own (or not working at all). These classes include frequent lessons (whole-class or small-group, depending on grade level and subject matter) in which the teacher presents information and develops concepts through lecture and demonstration, elaborates this information in the feedback given following responses to recitation or discussion questions, prepares the students for follow-up seatwork activities by giving instructions and going through practice examples, monitors progress on assignments after releasing the students to work independently, and follows up with appropriate feedback and reteaching when necessary. The teacher

conveys the content to the students rather than depending on the curriculum materials to do so, but conveys information mostly in brief presentations followed by recitation or application opportunities. There is a great deal of teacher talk, but most of it is academic rather than procedural or managerial, and much of it involves asking questions and giving feedback rather than extended lecturing.

The findings summarized above deal primarily with quantity of academic activity, particularly the time spent in organized lessons and supervised seatwork. The following variables concern the form and quality of teachers' organized lessons.

Giving Information

Variables of lesson form and quality can be divided into those which involve giving information (structuring), asking questions (soliciting), and providing feedback (reacting). The following variables apply to the function of giving information.

Structuring. Achievement is maximized when teachers not only actively present material, but structure it by: beginning with overviews, advance organizers, or review of objectives; outlining the content and signaling transitions between lesson parts; calling attention to main ideas; summarizing subparts of the lesson as it proceeds; and reviewing main ideas at the end.

Redundancy/sequencing. Achievement is higher when information is presented with a degree of redundancy, particularly in the form of repeating and reviewing general rules and key concepts. In general, structuring, redundancy, and sequencing affect what is learned from listening to verbal presentations, even though they are not powerful determinants of learning from reading text.

Clarity. Clarity of presentation is a consistent correlate of achievement, whether measured by high-inference ratings or low-inference indicators such as absence of "vagueness terms" or "mazes." Knowledge about factors that detract from clarity needs to be supplemented with knowledge about positive factors that enhance clarity, but in any case, students learn more from clear presentations than from unclear ones.

Enthusiasm. Enthusiasm, usually measured by high-inference ratings, appears to be more related to affective than to cognitive outcomes. Nevertheless, it often correlates with achievement, especially for older students.

Pacing/wait-time. "Pacing" usually refers to the solicitation aspects of lessons, but it can also refer to the rate of presentation of information during initial structuring. Although few studies have addressed the matter directly, data from the early grades seem to

favor rapid pacing, both because this helps maintain lesson momentum (and thus minimizes inattention) and because such pacing seems to suit the basic skills learning that occurs at these grade levels. Typically, teacher presentations are short and interspersed with recitation or practice opportunities. At higher grade levels, however, where teachers make longer presentations on more abstract or complex content, it may be necessary to move at a slower pace, allowing time for each new concept to "sink in."

Questioning the Students

The variables in this section concern the teacher's management of public response opportunities during recitations and discussions.

Difficulty level of questions. Data on difficulty level of questions continue to yield mixed results. It seems clear that most (perhaps three-fourths) of teachers' questions should elicit correct answers, and that most of the rest should elicit overt, substantive responses (incorrect or incomplete answers) rather than failures to respond at all. Beyond these generalities, optimal question difficulty probably varies with context. Basic skills instruction requires a great deal of drill and practice, and thus frequent fast-paced drill/review lessons during which most questions are answered rapidly and correctly. However, when teaching complex cognitive content or when trying to stimulate students to generalize from, evaluate, or apply their learning, teachers will need to raise questions that few students can answer correctly (as well as questions that have no single correct answer).

Cognitive level of questions. The cognitive level of a question is conceptually separate from its difficulty level. Extant data refute the simplistic (but frequently assumed) notion that higher-level questions are categorically better than lower-level questions. Several studies indicate that lower-level questions facilitate learning, even learning of higher-level objectives. Furthermore, even when the frequency of higher-level questions correlates positively with achievement, the absolute numbers on which these correlations are based typically show that only about 25% of the questions asked were classified as higher level. Thus, in general, we should expect teachers to ask more lower-level than higher-level questions, even when dealing with higher-level content and seeking to promote higher-level objectives.

Clarity of questions. Teachers can train students to answer by showing a willingness to wait for the answer; however, clarity of question is also a factor. Students sometimes cannot respond because questions are vague or ambiguous, or because the teacher asks two or more questions without stopping to get an answer to the first one.

Post-question wait-time. Studies of science instruction have shown that students achieve better when teachers pause for about

three seconds (rather than one second or less) after questions, to give the students time to think before calling on one of them. This variable has not been addressed in other contexts. It seems likely, however, that length of pause following questions should vary directly with their difficulty level and especially their complexity or cognitive level. A question calling for application of abstract principles should require a longer pause than a factual question.

Waiting for students to respond. Once teachers do call on students (especially nonvolunteers), they usually should wait until the students offer a substantive response, ask for help or clarification, or overtly say "I don't know." Sometimes, however, especially in whole-class lessons where lengthy pauses threaten continuity or momentum, it will be necessary for the teacher to curtail the pause by making a response.

Reacting to Student Responses

Once the teacher has asked a question and called on a student to answer, the teacher then must monitor the student's response ((or lack of it) and react to to.

Reactions to correct responses. Correct responses should be acknowledged as such because, even if the respondent knows that the answer is correct, some of the onlookers may not. Ordinarily (perhaps 90% of the time) this acknowledgement should take the form of overt feedback which may range from brief head nods through short affirmation statements ("right," "yes") or repetition of the answer, to more extensive praise or elaboration of the answer.

Reacting to partly correct responses. Following responses that are incomplete or only partly correct, teachers ordinarily should affirm the correct part and then follow up by giving clues or rephrasing the question. If this does not succeed, the teacher can give the answer or call on another student.

Reacting to incorrect responses. Following incorrect answers, teachers should begin by indicating that the response is not correct. After indicating that the answer was incorrect, teachers usually should try to elicit an improved response by rephrasing the question or giving clues. Such response improvement attempts are likely to be facilitative when they are generally successful, but teachers should avoid "pointless pumping" in situations where questions cannot be broken down or the student is too confused or anxious to profit from further questioning.

Sometimes the feedback following an incorrect answer should include not only the correct answer but a more extended explanation of why the answer is correct or how it can be determined from the information given. Such extended explanation should be included in the feedback whenever the respondent (or others in the class) might

not "get the point" from hearing the answer alone, as well as at times when a review or summary of part of the lesson is needed.

Reacting to "no response". Teachers should train their students to respond overtly to questions, even if only to say "I don't know." Thus, if waiting has not produced an overt response, they should probe ("Do you know?"), elicit an overt response, and then follow up by giving feedback, supplying the answer, or calling on someone else (depending on the student's response to the probe).

Reacting to student questions and comments. Teachers should answer relevant student questions or redirect them to the class, and incorporate relevant student comments into the lesson. Such use of student ideas appears to become more important with each succeeding grade level, as students become both more able to contribute useful ideas and more sensitive to whether teachers treat their ideas with interest and respect.

Handling Seatwork and Homework Assignments

Although independent seatwork is probably overused and is not a substitute for active teacher instruction or for drill/recitation/discussion opportunities, seatwork (and homework) assignments provide needed practice and application opportunities. Ideally, such assignments will be varied and interesting enough to motivate student engagement, new or challenging enough to constitute meaningful learning experiences rather than pointless busywork, and yet easy enough to allow success with reasonable effort.

Students should know that work they are accountable for, how to get help when they need it, and what to do when they finish. Performance should be monitored for completion and accuracy, and students should receive timely and specific feedback. If the whole class or group has the same assignment, review of the assignment can be part of the next day's lesson. Other assignments will require more individualized feedback. If performance is poor, teachers should provide not only feedback but reteaching and follow-up assignments designed to insure that the material is mastered.

Conclusion

First, we can conclude that recent classroom research has produced rich empirical findings and concepts that have considerable potential to affect classroom practice. In the last decade researchers have produced direct evidence to refute the myth that teachers do not make a difference. This is important information in relation to policy, because it indicates that teachers are a vital investment. Furthermore, we have gained new models for analyzing instruction, models that are valuable to practitioners. However, we need to know

much more about the quality and combinations of teaching processes that are associated with increases in student achievement.

A second conclusion is that recent classroom research findings need to be systematically disseminated in teacher education programs, although such information should be presented in a decision-making format that enables students to examine concepts and to apply them to unique settings (for a good illustration of this idea, see Amarel, 1981 and Good & Brophy 1978, 1984). Teacher training programs should not encourage students to make literal and unalterable interpretations of concepts and research findings. We know that there can be too much as well as too little alerting or accountability (or any other variable).

To articulate and successfully implement a teacher education program that carefully combines process skills, research insights, and subject matter knowledge that enables teachers to become active decision makers is in itself a massive step that merits systematic study. Translation of research findings into recommendations for practice is a very difficult task and one which is often ignored in teacher education programs. Still, we must convey to teachers that learning is problematic because classroom problems and contexts vary. Teachers must also know that concepts and findings from research yield greater awareness of problems and alternative ways for solving them, but do not offer answers to educational problems.

A good example of the need to use classroom research findings as tools rather than answers can be seen in Adams and Biddle's (1970) discussion of the "action zone." They found that students who sat in the middle-front-row seats and in seats extending directly up the middle aisle received more opportunities to talk in class than did other students. This research is valuable, and it suggests that there may be areas of a classroom where students receive more response opportunities than students in other areas. However, this study could be interpreted too literally, as implying that teachers and/or classroom observers should pay most attention to what takes place in the front row and the middle of a classroom.

Recent data collected by Alhajri (1981) show the utility of viewing the action zone as a concept rather than a generalized phenomenon. In 32 classrooms the investigator found only one that had an action zone like that described by Adams and Biddle; however, Alhajri found many classrooms in which some kind of action zone was present. If observers or teachers were monitoring classes for only one type of action zone, they would not have perceived the action zones that were present in these classrooms because they took a different form.

A third general conclusion deals with consolidating and enhancing progress in classroom research through new research. I believe that research needs to become more comprehensive than it has in the past. Past research has examined single variables of schooling such as the curriculum, or teachers, or students. As stated earlier, if

research is to be effective, its context must be focused. However, within the particulars of a single study (e.g., middle school science classes), research needs to become more comprehensive. If classroom learning is to be improved and/or understood, future studies must describe the concepts and subject matter issues being examined as well as how teachers and students think and behave when they study these concepts. Finally, I believe that we must consider more seriously the meanings of findings and their relationship to practice than we have traditionally done. We must attempt to understand as well as to describe and to generate theories and explanations as well as concepts and findings.

APPENDIX 1

COMMUNICATION OF LOW EXPECTATIONS

1. Calling on lows less often to answer classroom questions or make public demonstrations.

2. Waiting less time for lows to answer questions.

3. Praising lows less frequently than highs after successful public responses.

4. Criticizing lows more frequently than highs for incorrect public responses.

5. Not staying with lows in failure situations (providing clues, asking follow-up questions).

6. Seating slow students farther from the teacher or in a group (making it harder to monitor low-achieving students or treat them as individuals).

7. Paying less attention to lows in academic situations (smiling less often and maintaining less eye contact).

8. Praising lows more frequently than highs for marginal or inadequate public responses.

9. Providing low-achieving students with less accurate and less detailed feedback than highs.

10. Failing to provide lows with feedback about their responses more frequently than highs.

11. Demanding less work and effort from lows than from highs.

12. Interrupting the performance of low achievers more frequently than that of high achievers.

13. Organizing assignments for lows around drill and practice in contrast to the organization of assignments for highs around meaning and concepts.

For additional information about the ways in which teachers communicate expectations to students, see Good, T. and Brophy J. Looking in classroom. New York: Harper & Rowe.

APPENDIX 2

SUMMARY OF KEY INSTRUCTIONAL BEHAVIORS

Daily Review (first 8 minutes except Mondays)

1. Review the concepts and skills associated with the homework.
2. Collect and deal with homework assignments.
3. Ask several mental computation exercises.

Development (about 20 minutes)

1. Briefly focus on prerequisite skills and concepts.
2. Focus on meaning and promoting student understanding by using lively explanations, demonstrations, process explanations, illustrations, etc.
3. Assess student comprehension
   a. Using process/product questions (active interaction),
   b. Using controlled practice.
4. Repeat and elaborate on the meaning portion as necessary.

Seatwork (about 15 minutes)

1. Provide uninterrupted successful practice.
2. Momentum--keep the ball rolling--get everyone involved, then sustain involvement.
3. Alerting--let students know their work will be checked at end of period.
4. Accountability--check the students' work.

Homework Assignment

1. Assigning on a regular basis at the end of each math class except Fridays.
2. Should involve about 15 minutes of work to be done at home.
3. Should include one or two review problems.

Special Review

1. Weekly review/maintenance
   a. Conduct during the first 20 minutes each Monday.
   b. Focus on skills and concepts covered during the previous week.
2. Monthly review/maintenance
   a. Conduct every fourth Monday.
   b. Focus on skills and concepts covered since the last monthly review.

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